REMARKS

In the drawings:

Applicant refers to the Office Action mailed January 15, 2003. The examiner has made an objection to the drawings for failing to complied with 37 CFR 1.84(p)(5). In response, the specification has been amended to overcome this objection. Because the formality objection has been addressed, applicant respectfully requests the Examiner to withdraw the objection.

Applicant also amended the specification to further clarify the description by adding the sentence: "The convergent cylindrical rectangular lens 13 focuses the excitation radiation into a beam of focused light with an elongated cross-section throughout its length, e.g, a line." This amendment is supported by the drawings, e.g. FIG. 1. It is understood by one skilled in the art that the cylindrical rectangular lens 13 is capable of focusing the excitation radiation into a beam of light with an elongated cross-section, for example, a thin line of light. Applicant submits that no new matter has been added.

In the claims:

Claim 27 was objected to because of a spelling error. Applicant has amended claim 27 to overcome this objection.

Claims 1-40 were rejected under 35 U.S.C. 112, first paragraph and second paragraph. In response to the rejections under 35 U.S.C. 112, the claims have been amended to overcome these rejections.

Because the formality objection and the rejections under 35 U.S.C. 112 have been addressed, applicant respectfully requests the Examiner to withdraw these objection and rejections.

Applicant has further amended claim 1 to clarify the claimed invention by adding the phrase "into a beam of focused light onto the sample, wherein the beam has an elongated cross-section throughout its length."

Claims 1, 2, 5, 31/(1, 5), 32/(1, 5), 33/(1, 5), 34, 35, 36, 37 were rejected under 35 U.S.C. 103(a) as being unpatentable over Stern.

Claim 1, as amended, requires "at least one source radiation focusing and collimating means, positioned between the radiation source and the sample, for focusing and collimating the directed source radiation <u>into a beam of focused light onto the sample, wherein the beam has an elongated cross-section throughout its length</u>" and a blocking panel "for <u>blocking extraneous radiation of the b am of focused light and the emitted light</u>," the panel having at least one pinhole positioned <u>adjacent to the sample</u>. These features are neither disclosed nor taught by Stern. Particularly, Stern's system does not have a source radiation focusing and collimating means, e.g. a lens, capable of focusing source radiation into light beam having an elongated cross-section

throughout its length. In Stern's system shown in Fig. 4, the mirror 114 and the lens 116 are placed between the single, stationary pinhole 401 so that the pinhole is *not adjacent* to the sample 118. The mirror 114 is a rotating mirror that allows scanning of the beam into a *spot* onto the sample after focusing it by the lens 116. A spot is not an elongated shape. The arrangement of the mirror 114 and the lens 116 appear to be critical to the intended function of Stern's system. Placing the pinhole 401 adjacent to the sample, as suggested by the examiner, would not be mere rearrangement of parts because the light source could not be focused into a spot on the sample as disclosed. In addition, there is no blocking panel adjacent to the sample in Stern's system for blocking unwanted light and for reducing light scattering and interference, as in the case of the claimed system. The pinhole 401 in Stern's system is not used for blocking unwanted radiation. The set-up of Stern differs from the claimed invention not only in structure but also in function. Therefore, it follows that Stern teaches away from the present invention.

There is no evidence or teaching to indicate that Stern's system would function properly without the mirror 114 and the lens 116 between the pinhole 401 and the sample. Thus, the Stern reference cannot render the claimed invention obvious.

Because the limitations of claim 1 are not disclosed or suggested by Stern, it follows that the dependent claims 2, 5, 31/(1, 5), 32/(1, 5), 33/(1, 5), 34, 35, 36, 37 are also not disclosed or suggested by Stern.

Claim 3 was rejected under 35 U.S.C. 103(a) as being unpatentable over Stern in view of Smith.

As stated above, Stern neither discloses nor teaches applicant's optical detection system as claimed in claim 1. Smith discloses an annular electrophoresis apparatus system that includes a power supply 316 connected to the electrodes 314 located in buffer reservoirs. Smith's set-up that is quite different from the claimed system. Smith's system does not have optics for focusing and collimating the incident radiation into a beam of focused light having an elongated cross-section throughout its length and a blocking panel having at least one pinhole positioned adjacent to the sample. Therefore, the combination of Stern and Smith cannot render the claimed invention obvious.

Claim 4 was rejected under 35 U.S.C. 103(a) as being unpatentable over Stern in view of Smith and further in view of Hellinger.

Hellinger discloses a flow control system for a liquid chromatography apparatus, but does not disclose optics for focusing and collimating the incident radiation into a beam of focused light having an elongated cross-section throughout its length and a blocking panel having at least one pinhole positioned adjacent to the sample. Therefore, the combination of Stern, Smith and Hellinger cannot render the claimed invention obvious.

Claims 7 and 8 were reject d under 35 U.S.C. 103(a) as being unpatentable over Stern in

view of Walt.

Walt discloses filter wheels (202, 210) in an optical sensing appartus, but, like Stern, Walt neither discloses nor suggests optics for focusing and collimating the incident radiation into a beam of focused light having an elongated cross-section throughout its length and a blocking panel having at least one pinhole positioned adjacent to the sample. Therefore, the combination of Stern and Walt cannot render the claimed invention obvious.

Claims 9, 26(1, 5, 9), 30/(1, 9), 31/9, 32/9 and 33/9 were rejected under 35 U.S.C. 103(a) as being unpatentable over Stern in view of Tanaami.

In Tanaami's system, an objective lens 18 is placed between the pinhole array 18 and the sample for focusing the light into a light spot on a sample. The pinholes 18 are not used for blocking undesirable light and are not adjacent to the sample. In addition, Tanaami's system does not have a focusing and collimating means for focusing the incident radiation into a beam of focused light having an elongated cross-section throughout its length as in the claimed invention. Therefore, the combination of Stern and Tanaami cannot render the claimed invention obvious.

Claims 28/(1, 5) and 38 were rejected under 35 U.S.C. 103(a) as being unpatentable over Stern in view of Bogdanov.

Claims 28/9 was rejected under 35 U.S.C. 103(a) as being unpatentable over Stern in view of Tanaami and further in view of Bogdanov.

Bogdanov discloses a cylindrical focusing lens 4 but it is arranged in a set- up entirely different from the claimed optical detection system. In Bogdanov's system, the focusing lens 4 is not used in combination with a blocking panel with at least one pinhole placed adjacent to the sample. Thus, the focusing lens 4 of Bogdanov is not used for the same purpose as in the claimed system. Furthermore, incorporating the focusing lens 4 of Bogdanov into Stern's system would still not meet all of the limitations of claim 1. Specifically, neither Stern nor Bogdanove discloses a blocking panel with at least one pinhole adjacent to the sample. As pointed out above, Tanaami's system has neither means for focusing the incident radiation into a beam of focused light having an elongated cross-section throughout its length nor a pinhole adjacent to the sample as in the claimed invention. Therefore, neither the combination of Stern and Bogdanov nor the combination of Stern, Tanaami and Bogdanov can render the claimed invention obvious.

Claims 39 and 40 were rejected under 35 U.S.C. 103(a) as being unpatentable over Stern in view of Smith and further in view of Christian.

Christian discloses an assay card having multiple channels, but does not disclose an optical detection system with optics for focusing and collimating the incident radiation into a beam of focused light having an elongated cross-section throughout its length and a blocking panel having at least one pinhole positioned adjacent to the sample. Therefore, the combination of Stern, Smith and Christian cannot render the claimed invention obvious.

Claim 41 has been added to claim another feature of the present invention: a blocking panel having a pinhole that is movable relative to the source radiation focusing and collimating means and the sample platform. None of the references cited by the examiner discloses or suggests this feature.

For the above reasons, applicant respectfully submits that the present application is in condition for allowance. Reconsideration of the present application and a favorable response are respectfully requested.

If the Examiner has any further questions, or believes that a telephone interview would be helpful to the advancement of the prosecution of the subject application, a telephone call to the undersigned would be appreciated.

Respectfully submitted,

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4/14/03
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4/14/03
Date

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

Please replace the paragraph bridging pages 11 and 12 with the following paragraph:

FIG. 1 is a general schematic illustration of the multichannel epifluorescent detection system using a moving pinhole. The system includes a radiation source 10, an interference filter 11, a dichroic beamsplitter 12, a convergent cylindrical rectangular lens 13, a long pass filter 14 and a photon detector 16. The source irradiates excitation light 19 to the dichroic beamsplitter 12 which is positioned at an angle (which is 45° in this example) to the beam. This beamsplitter reflects radiation of wavelengths below the specified wavelength, acting as a long pass filter. The reflected radiation is then directed axially to the sample channels 20. An interference filter 11 is preferably included in this embodiment to isolate the wavelength necessary for excitation of the fluorescent sample and at the same time eliminate the background scatter caused by the radiation of undesired wavelengths. The interference filter 11 is particularly essential to isolate the necessary excitation wavelength when the light source employed is not monochromatic, such as Hg, Xe, or tungsten lamps. <u>The convergent cylindrical rectangular lens 13 focuses the excitation radiation into a beam of focused light with an elongated cross-section throughout its length, e.g. a line.</u> The axis of the convergent cylindrical rectangular lens 13 is placed perpendicular to the microchannels 20 or, perpendicular to the array of samples to be determined. A simple pinhole 17 with an aperture matching the size of the area to be detected allows the excitation beam to reach a selected sample. The resulting fluorescent emission 23 is collected axially by the convergent cylindrical rectangular lens 13, and transmitted through the dichroic beamsplitter 12 and a long pass filter 14, and then focused onto the photodetector 16 by a convex lens 18. The band pass filter 14 is selected to block any background or scattered light from the radiation source. After the release of the emitted radiation 23, a scanner or conveyer system 21 causes the pinhole 17 (not drawn to size) to move to the next microchannel. In this manner, by scanning the pinhole 17, the excitation radiation and the fluorescent emission is sequentially brought to and collected from every microchannel or sample volume in the array. The permanence time of the pinhole in every sample is pre-set and electronically controlled to allow for the excitation and emission of every individual sample before moving to the next. By incorporating a moving pinhole 17, the detection system of the present invention avoids the interference caused by cross talk between channels since one sample is illuminated at the time. By using a pinhole 17, interferences due to scattered light from the optics and the mass of the glass plate 22 comprising the channels are further avoided. The system can be modified for multicolour fluorescence detection by adding a rotating filter wheel 30 (shown in Figure 1B) before the detector. The filter wheel comprises a predetermined number (usually 4) of band filters which are designed to block the radiation at the wavelengths of the excitation radiation sources and transmit fluorescence at wavelengths typically

longer than those for the excitation wavelengths. The filter wheel 30, controlled [contolled] by means of a rotor 26, rotates and brings sequentially [sequentally] the set of filtered into the path of the emission beam, thus permitting the detection of the fluorescent emission of different dyes present in the sample.

IN THE CLAIMS

Please amend Claims 1, 2, 9, 14, 15, 21, 27 and 30 as follows:

1. (Amended) An optical detection system comprising:
   - a) at least one electromagnetic radiation source directing source radiation at a sample platform containing at least one sample;
   - b) at least one source radiation focusing and collimating means, positioned between the radiation source and the sample for focusing and collimating the directed source radiation into a beam of focused light onto the sample, wherein the beam has an elongated cross-section throughout its length;
   - c) at least one photodetector adapted for receiving light [radiation] emitted from the sample;
   - d) at least one emitted radiation focusing means, positioned between the photodetector and the sample, for focusing the emitted light from the sample onto the photodetector; and
   - e) at least one source radiation blocking panel, positioned between the source radiation [excitation light] focusing and collimating means and the sample, for blocking extraneous radiation of the beam of focused light and the emitted light, said panel having at least one pinhole wherethrough source radiation can pass, said pinhole provided in a position adjacent to the sample such that focused and collimated source radiation is directed onto the sample.

2. (Amended) An optical detection system according to claim 1 wherein the sample platform comprises at least one microfabricated channel, or a microfabricated array electrophoresis chip, or at least one capillary column, or at least one flow cell.

9. (Amended) An optical detection system according to claim 1 [5] wherein a plurality of pinholes are dispos d on the source radiation blocking panel at predetermined distances, said

predetermined distance being the distance or a multiple of the distance between the samples arranged in an array.

14. (Amended) An optical detection system according to claim 1 [5] wherein the emitted radiation focusing means comprises a convergent cylindrical rectangular lens.

15. (Amended) An optical detection system according to claim 14 wherein the source [further comprising a emitted] radiation blocking panel is provided with a plurality of pinholes [provided between the emitted radiation focusing means and the photodetector].

21. (Amended) An optical detection system according to claim 17 [20] further comprising a [an] second emitted radiation blocking panel with at least one pinhole disposed between the second emitted radiation focusing means and the second photodetector, said pinhole wherethrough collimated second higher wavelength radiation can pass.

27. (Amended) An optical detection system according to claim 5, 9, 13, 16 or 24 wherein said source radiation blocking panel is made of radiation absorbing [abosrobing] material; and scanning means, connected to said source radiation blocking panel, are provided for shifting the source radiation blocking panel at predetermined distances and predetermined time intervals, said predetermined distance being the distance or a multiple of the distance between the different samples arranged in an array; and said predetermined time interval being the time used to collect emitted radiation from each sample via said pinhole.

30. (Amended) An optical detection system according to claim 1, 9, 13, 16 or 24 wherein a plurality of pinholes are disposed on the source radiation [excitation] blocking panel at predetermined distances, said predetermined distance being the distance or a multiple of the distance between the samples arranged in an array.